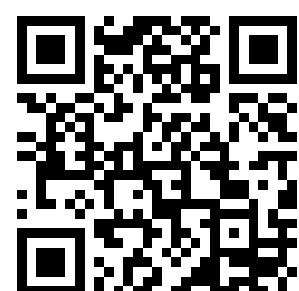

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SHANGHAI. MUNICIPAL COUNCIL
Drainage of the settlements

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Shanghai Municipal Council

DRAINAGE OF THE SETTLEMENTS.

REPORT OF THE PUBLIC WORK'S COMMITTEE, SUBMITTED TO THE COUNCIL, 26TH SEPTEMBER, 1870.



In compliance with the resolution passed at the last Rate-payer's meeting, your Committee now submit the following report (*A*) of the Municipal Engineer Mr. E. H. Oliver, dated May 19th, 1870; and scheme under which the present system of drainage has been conducted and under which it is proposed to continue until the whole settlement is effectively drained.

As operations connected with drains could not be carried on before cool weather, your Committee considered the intervening time would be well occupied by collating all the schemes, reports, minutes etc., regarding drainage of the settlement since it was first contemplated in 1862. They now hand the result with this report; and would add that the compilation has been made chiefly to serve for future reference and not because it was necessary as an explanation of the plan of drainage at present pursued, as that is very fully set forth in the Municipal Engineer's report above alluded to, and in his notes (*C*) of 21st March 1868; which, as you will perceive by reference to them, amount to this; that the original scheme of Mr. Carlisle was condemned by his successor Mr. Clark (and also by Mr. Oliver) who proposed another scheme, the "arterial," but this, owing to the necessity it involved of abandoning the sewers then already laid which had cost so much, and causing an immense further outlay, was not sanctioned. The only alternative then Mr. Oliver, who succeeded Mr. Clark, had, was to utilize those drains as far as possible, and to proceed on a system of laying large main drains through the principal streets running N. and S. having a fall from the centre—say Kiukiang Road—each way to the Soochow and Yang-king-pang Creeks, and, connected with them, smaller drains in the streets running E. and W. The drains running N. and S. would have to be relaid in great part to give them the necessary fall, and the few that existed in the other streets (E. and W.) would in nearly every instance have to be newly built to accommodate them to the main drains.

This scheme, the most practicable, effective and cheapest was adopted by the then Council, and has been carried out by successive Councils until all the main drains are completed except that in Szechuen Road, and a small portion of the Hoopeh Road, which are the ones to be finished this year. The *plan so far has worked well*, the drains are effective, keep clean, as on examination little or no deposit is found in them, and after the remaining drains are completed the flushing of the whole of those N. and S. will be possible, should it be necessary, but with the inclination they will have, and the rain water expected to be carried through them when the houses are properly guttered, it is supposed they will not require flushing, or at all events but seldom. (See note (*D*) in the "Memorandum" regarding flushing by tides.)

Wherever it is possible drain pipes should be used for the E. and W. streets, but your Committee strongly recommend brick drains in the streets in the closely built portions of the town.

A plan of the drains, showing those completed, those proposed, the present defective ones, high and low water mark, and also an estimate (*B*) of the cost of the subsidiary drains, are appended.

Your Committee have no better practicable plan to recommend than the one in operation, and, unless a more desirable one is submitted from other parties, they beg to be authorized as soon as possible to proceed with the work as it is essential the thorough drainage of the settlement should be accomplished without unnecessary delay.

JOHN G. PURDON,
S. J. G. JELLICOE, } Members, Public
W. REMÉ, } Work's Committee.

COUNCIL ROOM,

15, Honan Road,

SHANGHAI, 24th September, 1870.

861833

Engineer's Office,

SHANGHAI, 19th May, 1870.

TO THE COUNCIL FOR THE
FOREIGN COMMUNITY OF SHANGHAI.

GENTLEMEN,

With reference to the drainage of the English Settlement I beg to hand you the following memoranda.

In 1865, Mr. Clark, your late Engineer, estimated the cost of a complete and efficient scheme of drainage at over Tls. 250,000, totally condemning the system then in existence—see his report embodied in the Municipal Council report of 1864-65. At that time Tls. 65,000 had been spent by Mr. Clark's predecessors. Taking this into consideration, it was then determined by the Council to utilize as far as possible the drains then existing, and abandon any idea of a new system on account of the great outlay required.

The practice was then commenced of digging out the deposit in the sewers every year, but this was found to be ineffective, very expensive and dangerous to the public health.

On 21st March, 1868, at the request of the Public Works' Committee, I reported as published on pages 6 and 7 of estimate for 1867-68, stating "as the adoption of a new system would require the total abandonment of the present sewers, and necessitate a large expenditure, it appears to me that the only course to be pursued is to endeavour to utilize the existing drains as far as practicable," and recommending that the defective gradients in the main sewers be relaid, giving a fall north and south from, say, the Kiukiang Road as shown on plan A (made 21st March, 1868), the drains then existing being marked *red* and the portions proposed to be relaid colored *green*; and that the drains be periodically flushed by means of a proposed reservoir. This system was adopted, with the exception of the reservoir scheme (which was thrown out at the Land renters' meeting). I then, to avoid as much as possible the necessity of flushing, recommended the sewers to be made of a larger size (than I contemplated, in case the reservoir had been carried out), thus necessitating a larger expenditure than I estimated in report mentioned above.

Defective portions as shown on plan B, colored dark red, have been relaid, there only remaining the Szechuen Road sewer, and small portions of the Hoopeh and Honan Road sewers to be done to complete the main sewers.

The Szechuen sewer as shown on plan A is very defective. In its present form with undulating gradients it creates reservoirs of stagnant filth from the Canton Road to the Kiukiang Road, and from about 100 yards north of the Nanking Road to the Peking Road.

Before any additional drainage east and west as shown on plan B is commenced, it is very important that the gradients of the main sewers should be made as accurate as possible.

I am glad to report that the relaid sewers have, up to the present time, answered extremely well, and I think will still further be improved if the Council carry out the bye-law (XIV) new regulations, making it compulsory to provide guttering along house eaves, abutting on public thoroughfares, having down-pipes connected with the sewers.

As requested I send herewith a Schedule of main sewers, showing so far as I can ascertain, under whom constructed, lengths, gradients, shapes, sizes and cost. I also send plans numbered 1 to 10 referred to in schedule.

On plan B I have shown the subsidiary drains, those marked blue being in good working order, and those dotted blue defective. Positions of proposed drain pipes colored yellow.

In conclusion I beg to state that I shall be only too happy to explain any doubtful points to any one requiring information.

I am, Gentlemen,

Your obedient Servant,

E. H. OLIVER,

Engineer, Municipal Council.

Note.—The Plans referred to in the foregoing report, lie open to public inspection at the Council Room, 15, Honan Road.

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Schedule of Main Sewers, June 18th, 1870,

Showing original cost, cost of portions relaid, and estimated cost of portions requiring relaying.

* Stone additional found by Municipal Council. Since found record of portion between Canton and Foochow Roads—Coat Tls. 1,630-10.

B

Mr. Oliver, the Council's Engineer estimates the cost of completing the present system of drains to be as follows.

Completing main drains—Hoopeh and Szechen Roads as per Budget,	Tls. 15,000
Drain pipes and brick drains for all the main roads running East and West, not at present drained about 2,640 chang,	,, 39,600
	<u>Tls. 54,600</u>

Note.—Of the above sum, Tls. 18,000 has been appropriated by the Rate Payers, leaving a balance of Tls. 36,600 to be divided over future years.

MEMORANDUM IN REGARD TO DRAINAGE OPERATIONS IN THE FOREIGN SETTLEMENTS OF SHANGHAI.

Drainage operations on a large scale were first contemplated in 1862. At the Annual Meeting of Land Renters held at H. B. M.'s Consulate on the 31st March, 1862, the question of drainage was discussed. The following extract is subjoined from the Council's Report.

Drainage.—On this important topic, it would have been the duty of your Council to have addressed you carefully and at some length, had there not been called into existence by recent emergencies a Special Committee for Defences and Improvements, whose peculiar attention has been given to this point. It is therefore only necessary to say here that the Report of this Special Committee on Drainage and Water Supply, which report has lately appeared in the public papers,* has the cordial approval of the Council.

The report of the Special Committee (consisting of Messrs. Edward Cunningham, James Hogg, J. Priestley Tate, Edward Webb, and James Whittall) referred to above, in points bearing on drainage, is appended, also the discussion arising out of the Report.

REPORT UPON DRAINAGE AND WATER SUPPLY.

DRAINAGE.

In view of the absolute necessity of immediate measures, the Committee are compelled to consider this subject under two heads:—

First.—The adoption of some system, however imperfect and temporary, for present relief from the intolerable evils resulting from the damming up of all the water outlets of the central quarter of the Settlement.

Second.—The best plan for the complete drainage of the whole Settlement that they can obtain, and suggestions as to the mode of obtaining the required means.

To accomplish anything effectual, it is essential that the district lying between the Shakloo (now Fuhkien Road) and the Boundary (now Defence) Creek should be at once laid out in streets, in accordance with the Land Regulations. Nothing can be done in draining till the avenues are made, along which the drains must pass.

The Committee recommend that two new roads parallel to the Shakloo (now Fuhkien Road) be made, and for convenience in this report, they will give them the temporary names of the Sikh (now Quangse) Road and Soochow Road (now Hoopeh and Chekiang Roads). The Sikh Road to be on the line of the old Driving Course, reaching from creek to creek, and passing the Sikh Barracks and Major's factory. The Soochow Road to be opened midway between that and the Boundary (now Defence) Creek. The present lines of roads from the east to be continued to the Boundary Creek.

That wide and deep ditches through which the tide will flow be dug from creek to creek along both the Soochow and Sikh Roads, similar to that already dug in the Shakloo.

That the present ditch in the Shakloo, be piled and covered temporarily with planking until the autumn, when the drain can be laid. In this crowded thoroughfare the ditch cannot remain open on account of the inconvenience to the public. The question of covering in the other two ditches in the same manner to be left to the Committee appointed.

That any open ditches and ponds be made to drain into one of these three passages, and surface drains be conducted into them along the sides of each cross street.

That the Council be particularly requested to keep these three tidal passages open and unobstructed until time and circumstances allow of their being replaced by suitable drains.

These measures will unquestionably clear that part of the town of the stagnant waters now poisoning the air. However objectionable these open tidal ditches may seem to some, it is the only mode available to us of removing at once an unbearable and most dangerous nuisance.

Experience teaches us that the tide will keep them sufficiently free from noxious exhalations for purposes of health, even in hot weather.

These three drains by the aid of proper side or cross drains will clear the surface as far east as Barrier (now Honan) Road, and from that road to the river bank the ground is already sufficiently drained to answer another season.

In case the community determine to defer the construction of a comprehensive system of drains, the Committee recommend that as soon as bricks can be obtained, barrel drains of an oval shape 3 feet by 5 feet, be constructed along the Shakloo and Soochow roads to replace the ditches already recommended, and one of $1\frac{1}{2}$ by $2\frac{1}{2}$ feet along the Sikh Road on levels that shall serve when the whole system is laid down.

The cost supposing bricks were again plentiful would be:—

Length about 4,000 feet.	
2 lengths 8,000=800 ch. at Tls. 40,	..... Tls. 32,000
1 length 4,000=400 ch. at „ 14,	„ 5,600

Total,.....	37,600

For complete drainage of the Settlement, the Committee beg to present to the Meeting the following system, which is in many parts derived from the valuable suggestions of Colonel Moody, Royal Engineers, to whom the Committee are under many obligations for his very ready and cordial assistance and advice.

The objects to be obtained are:—

A system of drainage that will touch all parts of the Settlement between the River and the Boundary Creek and the Soochow and Yang-king-pang Creeks.

Some means of cleansing the main drains by forcing clean water through them.

The system proposes:—

1st.—To lay deep drains of the largest size, say 3 by 5 feet oval, along the Soochow, (Hoopeh and Chekiang) Shakloo, (Fuhkien) Barrier, (Honan) and Bridge (Szechuen) Roads, falling from the Yang-king-pang to the Soochow Creek, buried 5 feet under ground at the highest point.

2nd.—To lay medium drains of second size, say $1\frac{1}{2}$ by $2\frac{1}{2}$ feet oval, along the Sikh, Cemetery, (Shantung) and Church (Keangse) Roads, falling from the Yang-king-pang to the Soochow Creek, buried 2 feet under ground at the highest point.

3rd.—To lay drains of the same size, say $1\frac{1}{2}$ by $2\frac{1}{2}$ feet oval, along all the streets from East to West in the following manner—

Beginning on the outer line, those from the Boundary Creek to fall to the Soochow Drain and empty there. In the next section, commence at the Sikh Road and fall to the Soochow Drain, and also empty there. In the next commence at the Sik Road and fall eastward to the Shakloo. In the next section, commence at the Cemetery Road and fall to the Shakloo Drain. In the next section commence at the Cemetery Road and fall eastward to the Barrier Road. In the next commence at Church Street and fall eastward to Bridge Street; and in the next, fall to Bridge Street or the river.

4th.—The heads of the four large drains in the Soochow, Shakloo, Barrier, and Bridge Roads to be opened to the Yang-king-pang, though not draining in that direction, and to be provided with traps.

5th.—The Yang-king-pang to be provided with suitable tide gates, that it may be made a reservoir of clean water, for the flushing of the whole system of main drains at low water springs.

The Yang-king-pang being navigated, could only be closed twice a month for 6 or 8 hours at the height of the springs by permission of the authorities.

The cost is estimated as follows:

Length of line from Yang-king-pang to Soochow Creek 4,000 feet.	
4 lines of main drains 16,000=1,600 ch. at Tls. 40,	..... Tls. 64,000
3 lines of medium 12,000=1,200 ch. at Tls. 14,	„ 16,800
Length of line from River to Boundary Creek 5,184 feet.	
7 lines of drains 35,000=3,500 ch. at Tls. 14,	„ 49,000
Tide gates in Yang-king-pang,	„ 2,000
Traps and sundries,	„ 1,000

	Tls. 132,800

By this system only the four main drains would be flushed artificially; but the fall of rain-water is so great, that there is no doubt that the cross drains would be sufficiently cleared by that means.

* Vide North China-Herald of 5th April, 1862.

At the present moment no bricks can be had for even one line of drains—the rebels having cut off the supplies for the avowed object of distressing foreigners—and the system, if adopted, must wait for more propitious times. The representatives of the Community in the matter will find in the files of this Committee, numerous details furnished by Colonel Moody, which will enable them to carry out the system to great perfection if they have the services of an Engineer for the important work of laying the levels.

FRESH WATER.

The Committee recommend for this very important object, that the boundary creek be made a reservoir for the supply of the Settlement.

That a steam pump be provided, similar to those used in the docks, for filling the reservoir at the neaps, it being supposed that it would sufficiently fill itself at the springs.

That the water be conducted through iron pipes from the reservoir, along each of the seven streets from west to east, as far as Bridge Street, say 4,400 feet.

That oblong bricked tanks lined with cement, 4 feet wide by 4 deep or whatever is found necessary, and 30 feet long, be built at the corner of every street, into which the iron pipes would lead, at about 2 feet from the bottom.

That these tanks be covered and provided with pumps to which all should have free access.

As the pipes and tanks would be always filled with water at every high tide, it is supposed they would hold enough for use even in case of fire, to last while the tide was out. Any sediment would be deposited in the tanks which could be readily cleaned at stated intervals. The pipes would of course be provided with filterers and traps, at the point of communication with the reservoir.

The cost is estimated as follows:—

7 lines of 4,400 feet, 32,800 feet=	Tls. 10,	.....	Tls. 32,000
49 tanks, .....	"	.....	6,000
Steam Pump, .....	"	.....	4,000
Pumps and Sundries, .....	"	.....	1,000
			Tls. 43,000

To serve present wants however, the Committee recommend two lines of brick conductors from the Boundary Creek down the Maloo (now Nanking) and King's (now Western part of Foochow) Road, the cost of which would be about Tls. 12,000, the supply at low stages of tide being easily kept up by the chain pump, which could be made to fill temporary reservoirs at the mouths of the water-ducks.

These two lines of fresh water, ever flowing, would supply the ordinary needs of the whole of that great district, now entirely without supplies.

To recapitulate:

For temporary purposes—

Cost of 3 drains in the Shakloo, Sikh and Soochow Roads,	Tls. 37,600
Cost of 2 water-ducks and appurtenances,	" 12,400
	Tls. 50,000

For a complete system:—

Cost of drainage for the whole Settlement,	Tls. 132,800
Cost of abundant supply of water,	" 43,000
	Tls. 175,800

The Committee recommend a loan, with provision out of the yearly revenue for interest and a sinking fund, as the readiest means of meeting these requirements.

Also, that the whole matter of drainage and water supply be committed to the Municipal Council, with liberty to appoint a person to give it his particular attention and carry out promptly whatever plan is determined upon.

The following Notification was issued by the Council:—

SHANGHAI TEN PER CENT.—DRAINAGE LOAN OF 1862 AND SINKING FUND.

At a Meeting of the Municipal Council held the 7th instant, it was resolved that the sum of Shanghau Taels One Hundred and Thirty-two Thousand (Tls. 132,000) be raised on Loan at Ten per cent. per annum for the purpose of carrying out the System of Drainage recommended by the Committee of Improvements per their Report submitted to the Land Renters at the General Meeting, held at H. B. M.'s Consulate on the 31st ultimo.

The Loan will be secured by the Municipal Revenues of Shanghai and remain a fixed charge thereon until paid off.

The Loan will extend over a space of Ten Years and be repaid by a Sinking Fund of 10 per cent.

Debenture Certificates will be issued for Shanghai Taels 100 each.

A Tenth Part of these will be paid off yearly on the 1st July.

The numbers will be determined by lot, and be duly notified by advertisement in the public papers one month prior to that date.

The money will be required in three equal instalments, the first of which will fall due on the 1st July.

The 2nd and 3rd calls will be made on dates, of which notice will subsequently appear.

Applications for Stock received at the Municipal Council Room till 15th May next, when the usual allotment will be made.

HENRY TURNER,
Chairman.

MUNICIPAL COUNCIL ROOM,

SHANGHAI, 9th April, 1862.

It will thus be seen by the above, the course of action adopted from the commencement of initiating a system of drainage up to the time of the commencement of the work.

The following is upon Mr. Michie's authority:—

"There were no extensive drainage operations carried on here before 1862. The Cholera and the refugees came together that year. The Defence Committee urged on drainage operations then and the public anxiety neither brooked delay nor deliberation. The first of the series was the Fuikion Road. It was commenced by the Defence Committee digging a deep trench from Creek to Creek which festered for months before the Council could get the drain built, and I am not surprised that it has not lasted longer under the circumstances."

The actual sum raised on the loan floated was Tls. 78,267.96.

A special meeting of Land Renters was held on the 8th September, 1862. A brief allusion is made to the subject of drainage in the Council's Report, it is

"In conclusion the Council take this opportunity of informing the Land Renters that a portion of the Drainage Loan is still open, and they are ready to receive additional subscriptions."

An extract from the Council's Report read at the Land Renters' meeting of the 4th April, 1863, in regard to drainage is appended.

Roads and Drainage.—Your Council append a detailed statement A drawn up by the superintendent of the public works on these subjects, as the best evidence of their desire to sustain and complete the suggestions made this time last year by the Defence Committee. To meet the immediate outlay consequent upon a comprehensive scheme for draining the whole settlement at once, the Council advertised for a loan of Tls. 132,000, called the Shanghai Municipal 10 per cent. drainage loan, and Sinking Fund at 10 per cent. The response to this appeal fell far short of their expectations, and a sum of only Tls. 20,000 was realized. Nevertheless the Council have steadily progressed in this important work as far as the means at their disposal would permit. To enumerate the difficulties that presented themselves in the furtherance of this work, from the want, not only of materials but of skilled and even ordinary labor, would occupy more time than your Council have to spare, and call for the display of more patience, than probably it would be reasonable to expect at your hands. Suffice is to say: in their anxiety to overcome the difficulties referred to, that no less than 100 boats, and 500 men with a considerable quantity of treasure, have been captured and confiscated by the Rebels, into whose hands they have unhappily fallen.

The new roads recommended by the Committee, on the old Race Course have been opened, and Chinese buildings are rapidly springing up in that locality. To meet the danger likely to arise from the damming up of the old net-work of water outlet there, upon the approach of the hot season, the Council have ordered open drains to be constructed, as a part and parcel of the drainage scheme. These open drains would not only suffice to carry off the storm water from the surrounding land, but would be flushed with every tide, and thus save the community from the evils likely to arise from a collection of stagnant water.

The following statement comprises the principal works in this department.

STATEMENT—A.

SHAKLOO DRAIN.

Flagging, piping, building, &c., 345 chang, 3 feet by 5 feet, with a granite front at each end. Owing to alteration in line of excavation 50 chang.

DRAINS LEADING FROM SHAKLOO DRAIN.

The one past dye houses, a medium drain 2 feet by 3 feet, 71 chang.

Nanking Road in continuation of Maloo, 137 chang, small drain.

Canton Road, one small drain, 12 chang.

New street drain, medium 2 feet by 3 feet, 126 chang.

Keangse Road (late Church street drain) 3 feet by 5 feet, 127 chang.

DRAINS NOW IN PROGRESS ARE

1. In Keangsoo* Road (late Bridge street) medium.
2. Smith Road, medium.

SMALL DRAINS

Are being put in all parts of the settlement.

The Municipal Council's Report for the half year ended 30th September 1863, deals with the question of drainage as follows:—

DRAINAGE.

Locality.	Length of Channel.	Size of Drain.	When completed.
Hankow Road.	26 chang.	3 by 2 feet.	3rd April 1863.
Canton "	31 "	3 " 2 "	14th May "
Peking "	57 "	3 " 2 "	6th June "
Soochow "	161 "	3 " 2 "	15th "
Foochow "	138 "	3 " 2 "	21st July "
Keangse "	300 "	5 " 3 "	27th "
Keangsoo "	294 "	3 " 2 "	11th August "

SMALL DRAINS WITH WATER CHANNELS.

Locality.	Length of Channel.	Gully Holes.	When completed.
Soochow Road.	26 chang.	14 @ corners.	June 1863.
Foochow "	326 "	33 "	July "
Keangse "	34 "	13 "	" August "
Honan "	22 "	8 "	Sept. "
Shantung "	21 "	8 "	" "
Hang-chow "	153 "	—	" "
Keangsoo "	661 "	51 "	" "

Works.—The Works contemplated for the ensuing six months comprise:—

Drainage.—Continuing the drain in Honan Road from Hankow Road to Soochow Creek, taking up a portion of the old drain in Shantung Road, now partially filled up, and forming a new one to Nanking Road, also construction of a drain in Canton Road, from Keangse to Keangsoo Roads, and to lessen the chance of an accumulation of deposit, it is proposed that it shall be egg-shaped, and every precaution will be taken to make it as smooth inside as possible. All bends and junctions will be of as large a radius as practicable. The drainage of streets running East and West will be proceeded with as seems expedient.

The amount raised for drainage operations is as follows:—

Municipal Council 10 per Cent. Drainage Loan and 10 per Cent. Sinking Fund,	Tls. 18,200.00.
Temporary Drainage Loan,	" 31,067.96.
Total,.....	Tls. 49,267.96.

Whilst the Cost of Drainage from 1st of August 1862 to 30th September 1863, amounts to Tls. 55,451.01.

The Municipal Council Report for the year ended 31st March 1864 has the following in regard to drainage.

ENGINEER'S DEPARTMENT.

The following shews the extension of sewers:—

Locality.	Length.	When completed.
Drainage—Canton Road from Keangsoo Roads,	55 chang.	January 1864.
Honan " Foochow to Canton Roed,	55 "	February "
do. " Naukin Road to Soochow Creek, ...	156 "	In progress.

The following have been emptied of deposit:—

Locality.	Length.	When completed.
Honan Road from Naukin to Foochow Roads,	120 chang.	February 1864.
Shantung Road from Naukin Road to Yang-king-pang,.....	172½ "	March
Naukin " Honan to Keangse Road,	57 "	In progress."

As each of these was cleared, man-holes were formed 100 feet apart, and short connecting drains for the conveyance of surface water. Within the last three months 105 of these inlet drains to the main sewers have been completed.

On examination of several sewers, a rapid deposit was found to be taking place. The following were the gaugings in March:—

Locality.	Deposit.	When completed.
Soochow Road,	0 ft. 6 in.	June 1863.
Fuhkien "	1 " 9 "	
Keangse "	1 " 0 "	
Shantung "	was full but cleared.	Old.
Honan " from Canton Road to Yang-king-pang,.....	0 ft. 9 in.	
do. " Naukin to Foochow Road,	was full but cleared.	"
Keangse "	0 ft. 4 in.	July 1863.
Keangsoo "	0 " 3 "	Aug. "
Naukin " from Honan to Keangse,	was full but cleared.	Old."

On checking the levels of one sewer, parts appeared to have sunk considerably, the mouth having a good inclination and quiet clear of deposit, whilst the middle portion was in the form of a syphon, dipping towards the centre of the settlement. Owing to the want of office assistance, Mr. Clark has been unable to carry out a system of flushing, but when this is provided, means will be tried to remove the deposit.

The drainage east and west will be most difficult to accomplish, as the main sewers running north and south are so near the surface, that very little if any fall will be available.

To assist the drainage as much as possible, and to make the settlement drier, it has been suggested to collect all the rain water from the roofs of houses, and either convey it direct to the sewers or into water tanks. If this could be carried out, it is roughly calculated that nearly five million gallons of rain water, which now soak into the earth, could be conveyed from the settlement during 24 hours rain, after deducting a margin for evaporation and taking as a basis the greatest rain fall in England.

* Now Szechuen Road.

The cost of the Drainage operations, completed and in progress, will amount in the aggregate to about Tls. 104,165 and 23 cents, or Tls. 27,835 below the sum authorized to be raised for the defrayment of this expense.

The following arrangements are suggested.

The raising of Tls. 90,000 in three distinct Loan of Tls. 30,000 each.

The payment of the Agra Bank Loan,	Tls. 25,000.00.
Central Bank of India,	,, 31,067.96.
Mesrs. Dent & Co.'s,.....	,, 1,000.00.
,, Russell & Co.'s.....	,, 1,000.00.
Library,.....	,, 2,000.00.

Total,.....Tls. 60,067.96.

The Council's Report dated 31st March, 1865, containing an able and exhaustive Report from Mr. Clark, refers to drainage operations in these terms:—

3.—The extensions of the sewers through the Honan and Soochow Roads have been finished with the exception of their stone mouths. The difficulties of procuring suitable stone have retarded their completion as well as the diversion of the mouth of the Fuhkien Road drain, which was rendered necessary by the damage done during the building of the Fuhkien Road Bridge.

Drainage and Sewerage.—1. The difficulty encountered in procuring a sufficient fall for the extension of the Soochow sewer into the Soochow Creek, has induced me again to bring to your notice the incommensurate benefits attending the present expensive system: the cost and difficulty of construction will moreover appreciably augment, as the settlement and its drainage extend westwards; on account of the increased breadth, and from the higher level of the beds of the creeks.

2.—You are aware that on my engagement in England as Engineer for your Municipality, I was given to understand that no attempt at any regular drainage had been made; but that I found on my arrival, a desultory and unconnected series of drains laid down at vast expense, on an imperfect system as regarded their object—"surface drainage," and leaving the important sanitary question of "sewerage" untouched.

3.—The first measure that I proposed to you was the abolition of this system: but unwilling as you were to abandon it on my representations, after your predecessors had expended upon it sixty-five thousand Taels, it became my duty to endeavour to utilise it, and to execute what the future requirements of the settlement imperatively demanded, in a similar manner; that the whole might be turned, if possible, to practical account. I now admit with reluctance, that after persevering trial and experimental observation, I have arrived at the conclusion that the present system cannot be made to suit the wants of the settlement, and will be attended with continued heavy expense; as has been proved by those drains which it has been necessary to empty by hand at about one-fourth of their original cost.

4.—With the exception of the experimental drain running east and west in the Canton Road, the only two drain-extensions which I have constructed were absolutely necessary to reduce the amount of deposit in those existing.

That experiment in the Canton Road, between the Keangse and Keangsoo Roads, has been found to work well, as according to the latest gaugings it was free from deposit. but when it is considered that that drain is 3 feet 3 inches high, has more fall than the others, and cost thirty-six Taels per chang;—whilst a twelve inch glazed stone-ware pipe (area 113.09 inches) laid to a proper fall, would be large enough to convey sewerage, rain-water, and water supplied from waterworks, taking the highest estimated quantities, and would cost less than one-third of that amount—it will be seen that a disproportionate sum of money has been sacrificed for "surface-drainage."

5.—At the centre of the settlement, all the present drains are too high for the house drainage from either side, unless the roads and compounds be considerably raised to give the required fall. The house-drains, in fact, require taking up nearly every year, for want of a proper inclination.

6.—As my term of engagement will cease in another year, I beg leave to explain the system which I intended to carry out on my arrival. It is that commonly used for towns situated in flat countries or below the level of the sea; it would, in my opinion, prove very remunerative; and besides meeting all your requirements, and disposing of the question of sewerage, would pay in time even for the greater outlay on the present inefficient drainage, which it would supersede. It is called the "*Arterial system*," and would have worked thus—

Two main-sewers, egg-shaped, three feet three inches high, would have extended from the Bund up the Ningpo and Foochow Roads respectively, straight back through the settlement; uniting before passing under the Defence ditch, and afterwards terminating on the bank of the Soochow Creek at a pumping station, with tanks, engines, &c., complete.

Under all the other roads, fifteen-inch glazed stone-ware pipes (area 176.71 inches) would have been laid at the proper gradients; taking all drainage and sewerage from the houses to right and left, and discharging into the two main-sewers.

The drainage and sewerage, thus conveyed from the road channels and house-drains into the road-pipe, and from that into the main-sewer, would, on its arrival at the well at the pumping station, have been raised by engines, deodorised, and sold.

The main-sewers could be flushed from the Hwangpoo river, and the stone-ware subsidiary sewers from the Yang-king-pang, Soochow Creek, and Hwanpoo river.

7.—A margin of more than cent per cent on the calculations for England, has been allowed in the area of these sewers for rain-fall: and as a precaution against extraordinary floods, outlets would have been made in the main-sewers for the passage of storm-waters; so that by closing a sluice at the junction, if the drains should at any time be overcharged, the waters would be conveyed into the creek clear of the pumping-station.

At the pumping-station, engines of small horse-power would suffice at present; but should the whole of the settlement become as populous as the most densely-peopled part of London, engines 200 nominal H.P. would be requisite. By slightly increasing this power, they could be made available at the same time for adjacent water-works; which form a concomitant of this scheme and which are so much required. The same staff, buildings, &c., would do for both the enterprises; whereby a great saving might be effected.

8.—The principal sources of expense, therefore, would have been the two main-sewers, the labor, and the engines; for the glazed-pipes can be obtained from England for comparatively little. The sale of sewage is in China profitable, and the engines would yield interest by being leased to the Water-works. The prospective advantages to the Council of a sewers-rate, and (should it undertake the water-works) of a water-rate, must be apparent to all.

9.—As it may be a general impression that sewers and water-works are best separate, I may mention that the two can have no connection, other than the use of machinery, &c., in common, as is customary in Europe. The best water has been proved by analysis to be that of the Hwangpoo, near the Pagoda; this could be brought by gravitation to the pumping-station and there lifted to the necessary height.

In conclusion, I may be allowed to request that, for the satisfaction of all concerned, all schemes submitted to you by me, involving large outlay and effecting a variety of interests, may be laid before the best London Civil Engineers for an opinion; as, for instance, to Mr. Hawkshaw, for river improvements; and to Mr. Austin or Mr. Bazalgette, for drainage.—I have the honor to be, Gentlemen, Your obedient Servant,

(Signed) JOHN CLARK,—Engineer, M. C.

The Annual Report of the Council for the Municipal year ended 31st March 1866, has the following in regard to drainage.

Drains & Sewers.—After the repairs and renewals now in progress are completed, little remains to be done to the present drains.

The public market to supply the daily wants of the Settlement is now held every morning on the Maloo (Nankin Road). The country people place the baskets containing fish and vegetables in the open gutters on either side of this road; to remedy this disgusting practice, your Committee propose to construct a small covered drain in the centre of the Maloo, connecting with the main sewers, and entirely to do away with the open gutters, which now emit an offensive odour.

Further small works are required to the drains in the Taewan, Canton and Nankin Roads.

The Council's Annual Report for the year ended 31st March, 1867 has the following under the head of Drainage.

Drains.—* * A very large deposit having accumulated in the Shanse Road Drain it is imperatively necessary that it should be cleansed.

The Shantung Road Drain is completely choked up. Its construction being very faulty, your Committee have ordered a sufficient supply of earthenware drain pipes from England for the purpose of replacing it and to make a practical experiment with these pipes. It is also proposed to form a small drain in the Woosung Road, Hongkew, for the purpose of removing the surface water that accumulates between the Tiendong Road and the new Bridge.

Private Drains in Honan and Shantung Roads.—These works have been surveyed by Mr. Kidner and the Municipal Surveyor, whose reports are appended. Your Committee would recommend that the Council take over these drains and with this end in view an amount equal to their cost has been included in the estimate.

NOTE.—This is part of the report of the Works Committee from which however it is not to be inferred that little remained to complete any plan of drainage, but that, as the Council had abandoned the original scheme and had determined to make as little outlay as possible and had ordered only absolutely necessary repairs to be made, these had nearly all been completed and that in this sense there remained little to be done pending the adoption of some new system.

REPORT upon the state of the portions of the Sewers in the HONAN and SHANTUNG ROADS,
proposed to be purchased by the Municipality.

In pursuance of instructions received, we have made a careful survey of the Honan and Shantung Road Sewers, and beg to hand you the following Report thereon, with sketches attached.

Honan Road Sewer.—The length of this Sewer is 723 feet having a fall of 1 in 552; its smallest section being 3 ft. 2 in. by 3 ft.; its largest 5 ft. by 3 ft.; it is constructed upon piles, the bottom is formed with granite slabs, the walls and arch of large Brick. The Sewer mouth is composed of granite 4 ft. deep, is very substantially built, and has a section of 5 ft. by 4 feet.

This Sewer appears to be extremely well constructed (and is free from deposit) with the exception of a slight settlement of the brick arch near the mouth (which can be remedied at a trifling outlay) the work is apparently as sound as when first formed, and we consider it very valuable as a main outlet for Sewerage.

Shantung Road Sewer.—Length 539 feet, fall 1 in 260, smallest section 3 ft. 3 in. by 2 ft. 2 in. largest 4 ft. 8 in. by 2 ft. 10 in. mouth 4 ft. 7 in. by 3 ft. Soochow granite. This sewer is built upon piles, the bottom being of tiles and the foundation of the walls of Ningpo stone—walls and arch of large bricks.

As shown on sketch part of this Sewer underlies buildings, the rest is under the foot path. The Sewer having a considerable fall the deposit is very slight. We consider it perfectly sound and in good order.

Both the Honan and Shantung Sewers are properly supplied with Man-holes, Sinks, Sink drains, &c.

The cost of such Sewers at the current rates we consider would be,

Honan Road Sewer 72.3 Chang at Tls. 36.00	.....	2,602.80
Shantung Road Sewer { 31.0 } 53.9 Chang { at 28.00 Tls. 868.00 {	.....	1,371.80
{ 22.9 } " 22.00 " 503.80 }	.....

Tls....3,974.60

WM. KIDNER, Architect.

E. H. OLIVER, Engineer.

SHANGHAI, 23rd March, 1867.

There was no allusion made to drainage operations in the Council's Annual Report for the year ended 31st March, 1868.

The following appears in the estimate for the year commenced 1st April, 1868, and ended 31st March, 1869.

Drainage.—Appended is a report from the Municipal Surveyor upon the drainage of the English Settlement. The consideration of a new system, after such large sums have been expended upon the present sewers, appears to be unnecessary, and your Committee recommend to your consideration, the relaying of the sewers. The large amounts at present expended for cleansing would be saved, if this work were carried out, and the drains flushed periodically. Your Committee have included in next year's budget a sum of Tls. 6,000 for the relaying of the Keangse sewer, and Tls. 2,455 for the cleansing of some of the main sewers, and a further sum of Tls. 4,130 for small drains in the Maloo, on the Bund, and in Hougkew.

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MUNICIPAL COUNCIL, SURVEYOR'S OFFICE,
SHANGHAI, 21st March, 1868.

To the MUNICIPAL COUNCIL.

Gentlemen,—I beg to lay before you the following notes with reference to the drainage of the English Settlement.

There is a main sewer in each of the undermentioned roads, the Szechuen, Keangse, Honan, Shantung, Shansi, Fuhkien and Hoopoh. These drains have their outlets into the Soochow and Yang-king-pang creeks. No doubt when these sewers were constructed, it was the impression that the tides would flush them and prevent any deposit occurring that might otherwise obstruct the passage of the sewage, but a reference to the plans prepared will prove on the contrary, that a medium tide does not rise to anything like a sufficient height to even pass through them, (see lines A on sections, representing high water line on 16th March, 1868). These sections, which have been reduced from careful surveys, also show the defective gradients of the sewers, the undulating character of which in many instances negatives their utility.

These drains were condemned by your late Engineer in a report, dated 25th March, 1865. He also strongly urged upon the Council the advisability of abandoning these sewers, and adopting the arterial system of drainage.

As the adoption of a new system would require the total abandonment of the present sewers, and necessitate a large expenditure, it appears to me that the only course to be pursued is to endeavour to utilize the existing drains as far as practicable.

I would suggest, in the event of your deciding to adopt the scheme I laid before you in a report, dated 6th February, 1868, (subjoined) in which it was proposed to construct a large reservoir, capable of supplying sufficient water to flush the drains, that the defective gradients be remedied where necessary by relaying the sewers, their levels being at present, in many instances, so irregular that they would destroy to a great extent the benefit that would otherwise arise from the adoption of this proposal.

When the sewers are once laid, with a regular fall from the centre of the settlement towards their outlets, little difficulty will be experienced in keeping them clean by flushing them with water at regular intervals. A large expenditure that is now constantly being incurred for cleansing would thus be saved.

The parts of the sewers which it would be necessary to relay are shown on the sections.

In the Hoopoh Sewer there are	...	...	...	...	...	1,300 feet.
Fuhkien "	"	"	"	"	"	3,000 "
Honan "	"	"	"	"	"	800 "
Keangse "	"	"	"	"	"	2,400 "
Szechuen "	"	"	"	"	"	3,700 "

Total... 11,2000 feet.

The probable cost of this work would be about Tls. 25.0.0 per chang, or say in all Tls. 28,000; such relaying amounts in reality to constructing new sewers, as very little allowance is made by the contractors for the old material.—I am, Gentlemen, Your obedient Servant,

E. H. OLIVER,—Surveyor, Municipal Council.

MUNICIPAL COUNCIL SURVEYOR'S OFFICE,
SHANGHAI, February 6th, 1868.

To the MUNICIPAL COUNCIL.

Gentlemen,—In pursuance of your instructions I beg to lay before you the following notes, with reference to the supply of water in cases of fire in the English Settlement.

In addition to the water frontages, the Hwang-poo and Yang-king-pang, Defence and Soochow Creeks, there are available some ponds in the back part of the settlement, a pond in the church compound, and 9 fire-wells as marked on plan No. 1 attached hereto.

No dependence can be placed on the fire-wells, they being too small. Experiments have been made to ascertain the practicability of keeping them full of water by attaching them to the main sewers and allowing the tide to flow into them, but as only at two seasons in the year the tides are of sufficient height to flush the drains, the idea was abandoned.

Some improvements have been suggested and considered. The two following schemes appear the most feasible, both as regards outlay and efficacy.

First.—It is proposed to form in different parts of the settlement 7 reservoirs capable of each containing say 18 hour's supply for one fire engine's continuous pumping. One of these to be an open reservoir, four to be of brick with a timber covering occupying the sites of Chinese houses to be rented for the purpose, and two to be underground hard-wood reservoirs, as shown on plans marked No. 1 and 2.

The cost of carrying out these works I estimate as follows:—

1 open reservoir (No. 3 and 4 on plan 2),	...	...	...	...	Tls. 150
4 covered brick do. (No. 1 and 2 on do.),	...	...	...	...	" 4,800
2 street reservoirs (No. 5 and 6 on do.),	...	...	...	...	" 3,000
					Tls. 7,950

In addition to the above there will be a yearly charge for rent, &c.

In the second scheme (see plan No. 3) there would be laid down the centre of the settlement an 8-inch cast iron pipe con-

nected to a reservoir at, say, the head of Kinkiang road. The floor of the reservoir to be on a level with the Defence Creek road.

At every cross street it is proposed to have a plug on the 8-inch pipe, to which a hose could be connected for conveying water to any of the wells in case of fire. As the reservoir would be on a higher level than any of the roads in the settlement, the water would have sufficient pressure to force its way through the required length of hose. The size of the cistern to be 40 by 20 feet, by 12 feet deep, capable of containing 60,000 gallons or 12 hours supply for one fire engine. To fill the same a small engine of about 10 horse power would be required, by means of which a continuous supply of water could also be obtained when necessary from the Defence Creek.

This water would not only be useful for extinguishing fires, but also for flushing the main sewers, nearly all of which have a fall from the Kinkiang road, and for watering the streets in summer.

The cost of this scheme I roughly estimate as under:—

4,500 ft. of 8 in. piping with plugs, elbows, joints, &c. (including freight), Tls. 4,766
1 10-horse power engine, freight, &c., " 1,200
Fitting up engine, laying pipes, &c., " 1,000
1 brick reservoir, " 2,404
Tls. 9,370

A fireman's wages and rent of ground will have to be added to the above amount.—I am, Gentlemen, Your obedt. Servant.

E. H. OLIVER,—Engineer.

The Council's Annual Report for the year ended 31st March, 1869, has the following under the head of drainage.

Drainage.—Relaying main sewers could not, without running some risk to the health of the community, be commenced before the cool weather had set in. The New Keangse Road drain is *egg shaped*, built of brick, on six feet piles, and granite slabs. The Yang-king-pang mouth of this drain has been reconstructed of granite. Cesspools and small drains have been constructed in the upper Nanking Road.

Two Drains across fore-shore have been constructed by the Council, at the cost of the owners of the property drained.

Drains cleansed.—The following drains have been cleansed, wholly or in part: namely those of the Nanking, Shantung, Fuhkien, Foochow, Honan, Szechuen, Hankow and Keangse Roads. Various small drains have also been cleansed.

Surface Drains have been laid in the Shantung and Foochow Roads.

The side drain in the Hankow Road has been covered.

Earthen Drain Pipes have been taken into use with satisfactory results.

Open Trenches, to drain back parts of the settlements, have been formed where required.

Drainage—Hongkew.—Laying sewers in Tien-dong and Woosung Roads was not gone on with, as the position of the sewers depended on the line of new roads.

In the Estimate for the year 1st April, 1869 to 31st March, 1870, the following occurs in regard to drainage.

Drainage.—The relaying of the main sewer in Fuhkien Road in pursuance of the system adopted on the Engineer's Report of March 21st, 1868. The system requires the laying of one of the main sewers every year. That on the Keangse Road will be done this. Construction of certain main drains in Hongkew. Earthen drain-pipes to be laid on various subsidiary lines. Cleansing of some of the smaller drains. Additional open trenches in the back part of the settlement.

Plan for flushing drains.—It has been found by experiment that the tide can be used in flushing the drains.* By constructing sluices at the mouths of the few principal drains falling into the Soochow Creek and the Yang-king-pang when the great drains are relaid, a body of water can be forced through all the drains, which will flush them in a very thorough manner. This, to be sure, is not a new idea, but owing to the imperfect construction of the drains, it has never hitherto been fairly tried. When they are properly laid and the system perfect, there is little doubt that it will be as effectual as any mode that can be devised. The expense cannot exceed Tls. 2,000, and perhaps not one half of that sum will be necessary.

When the drains in the main streets running north and south are relaid on a gradient that will render flushing practicable, flood gates will be placed at each end. Twice in twenty-four hours—during the period of spring tides—the flood gates will be closed at the time of extreme high water. When the tide ebbs to the mouth of the drain, the gates will be opened at both ends, and the contents allowed to pass away.

It will be readily seen that the object aimed at, by this simple and economical experiment is to give the water that is held stationary till the tide ebbs to the mouth of the sewer, sufficient motion to flush the drain. And it is thought that, as the drains are now being constructed—much larger at the ends than in the centre—with a fall of about four feet from Nanking Road both ways, this desirable end will be attained at trifling cost.

For the year ended 31st March, 1870, the Council's Report deals with drainage as follows.

Drainage, Main Sewers.—The construction of brick main sewers egg-shaped in the Keangse, and flat-bottomed in Seward (new part) and South Yunan Roads have been completed. There are main sewers now being laid in the Fuhkien, Taiping, Keechong and Western portion of the Tientsin Road. The contract time for completing the Fuhkien Sewer is the 1st June.

Surface drains have been laid in the Broadway and Hongkew Road. The drain mouth of the Chow-Foong road is being re-constructed. The main drains cleansed wholly or in part during the past year are those of the Hoopch, Nanking, and Shansi Roads. Small drains, sinks or cess-pools and drain mouths have been cleansed as necessary.

The condition of the sewers has so far remained satisfactory.

A Schedule of the main sewers, shewing their form of construction, length, &c., owing to the want of some information could not be prepared in time for this report.

Earthen Drain Pipes.—The pipes obtained sometime ago from Canton were found to be of very inferior description, efforts were made to obtain earth pipes for drainage from the potteries in the neighbourhood of the Poyang Lake, but without success, so that your Committee had no alternative but to order a supply of earthen drain pipes, for draining the back parts of the Settlements, the new Cemetery, &c., from England.

Open trenches or ditches have been cut where necessary in both settlements.

Side channels have been laid in the Nanking, Whampoa and Hongkew Roads and in Broadway.

Outside Roads.—Western (Sinza) and North Well (Siccawei) Roads, the box-drains of these roads have been repaired and reconstructed as became necessary, on the South Well Road (Bubbling Well) ditches have been cut on both sides, small brick drains have been formed under the gateways of houses on this road.

Connexion Drains between buildings and main-sewers.—Your Committee have arranged, as a matter of convenience, that connexion drains will be formed under the superintendence of the Municipal Engineer, but at the expense of the person applying, your Committee have decided upon this measure as it is wholly impossible to construct main sewers to suit the elevation of private drains.

In the current year's estimate drainage is referred to thus.

Drainage.—Following the system proposed by the Municipal Engineer in March, 1868, it is now proposed to re-lay the main sewer in the Szechuen Road, to construct a new sewer in the Hoopch Road, between the Hankow Road and the Yang-yeh-kah. Earthen drain pipes to form subsidiary lines.

Drainage.—The continuance of the present system of re-laying one or more of the main sewers yearly to admit of the flushing of drains.

THE FOLLOWING ARE EXTRACT FROM THE MINUTES OF THE COUNCIL MEETINGS FROM

2ND APRIL 1862 TO 1ST AUGUST 1870 ON DATES AS UNDER.

2nd April.—It was ordered that the Secretary do communicate with the Chairman of the Defence Committee, requesting him to name an early day to meet the Council on the subject of the drainage of the settlement.

7th April.—Mr. Turner said that the Council would be glad to receive from the Defence Committee the report they wished to make on the drainage of the settlement. Mr. Cunningham replied that the Committee proposed to open two main drains from the Yang-king-pang to the Soochow Creek, in addition to the one recently opened in the Shakloo Road, the one under the proposed line of Road on the Old Race Course, to be named the Siik Road and the other to run parallel to it, to be called the Soochow Road.

Their inability at this crisis to procure a supply of bricks and prevented the Committee from building an oval drain in the Shakloo Road and they proposed, as the only alternative, to pile the ditch and plank it over as a temporary measure until this difficulty could be overcome.

It would be a tidal drain, and arrest the evils arising from the accumulation of stagnant water in that neighbourhood, and

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NOTE.—This should be read in a more general sense, as the experiment was never made with these drains, and the above portion of the Report of the Works Committee was never agreed to by the Engineer who always contended that the drains cannot be effectively flushed by the tides, owing to the fact that only once or twice in the year are tides sufficiently high to reach the most elevated parts of the drains and therefore the attempt would probably only result in depositing solid matter at those parts.

the cost would not exceed Tls. 2,500. The other two drains not being flanked by houses, might with safety be left open for the present. Mr. Webb observed that he had no doubt but that the Council would come to the same conclusion that the Committee had, namely, that Mr. Smith's plan of drainage was the most complete and perfect one,—that already proposed by the Committee was next, and the temporary measure just referred to, the least expensive; but he did not see where the funds were to come from to meet the heavy outlay of Tls. 275,000 proposed by Mr. Smith. It would be left to the Council to say whether the sum required for the plan of the Committee (Tls. 132,000) could be raised. Mr. Tate said that it would be obviously unfair to tax the present Land Renters solely, for a public work, that was to last for all time, he therefore proposed, as the most equitable and easiest mode of obtaining the money, to raise a loan.

The Finances of the Council shewed a balance of excess over expenditure, that would justify it in borrowing this money at ten per cent. interest, with a sinking fund of ten per cent.

This matter underwent a lengthened discussion, and eventually, at the suggestion of the Defence Committee, the following resolution was unanimously adopted shall be that recommended by the Committee of Defence and estimated to cost Tls. 132,000. That a loan shall be proposed at ten per cent. interest, and ten per cent. sinking fund, to be paid off year by year, ten per cent. each year, the amount being called for as required by the progress of the work. That as soon as bricks can be obtained, the main drains shall be commenced on the Sikh and Soochow Roads, to be continued eastward, as the cool weather of Autumn allows the streets to be opened. Mr. Michie, seconded by Mr. Cock, moved that application be made to the Admiral requesting his assistance in the use of a Gunboat to protect the boats to be employed by the Council in the transport of bricks to Shanghai for the purpose of carrying out this work. Agreed to.

The Inspector of Roads was ordered at once to obtain estimates for and proceed with the Shakloo drain.

9th April.—Tls. 400 was voted in part payment for the excavation in the Shakloo, and a contract for deepening the drain there 3 feet at each end for Tl. 1 per chang, was accepted.

Sundry applications for the drainage loan were laid on the table; ordered to be held over, until the closing day, 15th May.

16th April.—The Inspector of Roads made his report, when he stated that the deepening of the drain in the Shakloo would be completed as far as the Maloo that day, but that a constant falling in of the earth, had rendered it impossible to keep it entirely open.

23rd April.—A reply from Brigadier General Savige, signifying his readiness to grant at the request of the Council a Military escort to a flotilla of boats for a supply of bricks for drainage of the settlement, if information were afforded him of the extent distance from Shanghai of the place from whence the bricks were to be obtained, and whether in occupation of Rebels or not.

The Inspector of Roads made his report, when it was agreed that a further advance should be made to the contractor for the opening drain in the Shakloo.

The board agreed to accept a tender for the completion of this drain at Tls. 27 per chang, finding the wood necessary for piling and granite for same. The Secretary was ordered to take the necessary precautions to secure a complete fulfilment of this contract.

28th May.—The owners of buildings, in Bridge Street were also to receive notice to remove all drains fronting thereon.

25th June.—From Captains Gummel D. A. Q. M. G. and Gordon, Royal Engineers on the closing of a tidal drain near Glass Post. Secretary stated that he had taken measures to abate the Nuisance complained of.

The Inspector of Roads reported that he was in want of granite slabs for the drain in the Shakloo. Mr. Brand volunteered to communicate with a gentleman resident at Ningpo, on the probability of obtaining a necessary supply from that district. The Inspector of Nuisance reported that he had placed himself in communication with all the owners of property in the vicinity of the open drain at the back of H. B. M.'s Consulate and that they had agreed to bear each his own share of the expense of abating this Nuisance.

21st July.—A special Meeting of the Council was held at the usual place and hour on the subject of drainage of the settlement this day.

The Inspector of Roads was called and stated, in reply to some questions from the Treasurer, that the drain on the Shakloo was perfectly level and, when finished, would be flushed by the tides.

Mr. Grew suggested that such drains as were most essential to the preservation of the public health be commenced. With this view, it was resolved, that the new Road, * be at once carried through, and that contracts be opened for a brick drain there, from creek to creek (about 350 chang); also with the Sikh Road for a medium drain same length. Contracts to be made for drain by the Maloo to the Boundary Road, and drain in continuation of Fives Court Lane to Sikh Road.

Mr. Cock moved in reference to these drains, that shafts be erected at every main crooping to clean them out from time to time.

The Chairman brought forward the question of flushing the drains, in accordance with 6th Clause of the drainage system. Inspector ordered to report by next Meeting the most efficient place for a flood gate.

23rd July.—The Inspector of Roads made his report, when he said he had ascertained that from the lowness of the ground in the Old Race Course, the drains there could not be sunk more than 6 feet.

6th August.—Tenders were laid before the Council, and the Inspector of Roads was directed to accept the contract for the small drain on the Soochow Creek.

2nd August.—The Inspector of Roads made his report in the state of the several public works now in progress, and that the drains of the Maloo and Shakloo had been completed satisfactory by the contractor, and been found on trial effectually to carry off the waste water.

16th September.—The Inspector of Roads having made his report on the drains and other public works now in progress, from which it appeared that they were in a satisfactory state of advancement.

24th September.—The Inspector of Roads made his report and a requisition of Tls. 1,000 in part payment of the drain in Church Street and Tls. 500 for the one in the Shakloo was passed, to enable the contractors to proceed with their work.

2nd October.—Inspector Carlisle made his report and the following sums were voted for public works, viz: Contractor of Shakloo drain, Tls. 78. Side walk in Nankin Road, Tls. 180.

13th October.—Ordered that at the end of the drain in Church Street, a stone front be erected on the Soochow Creek level with the Bund, with flood gate attached, and to commence the main drain in Bridge Street without delay.

25th November.—Inspector Carlisle made his report when the sum of Tls. 1,000 was voted in part payment of drain in new Street Lowza, the balance to be paid when contractor had completed a certain amount of his new contract.

In reply to the Inspector's report of a deficiency of flag stones for the drains, he was ordered to supply the contractors from the Municipal stock in hand at cost price, to enable them to proceed with the work.

The Inspector reported that a large number of empty casks were required for the purpose of drainage. The Secretary was ordered to advertise for a supply.

31st December.—Council decided that a temporary loan of Tls. 25,000, for the purposes of drainage be raised; with reference to the drainage Loan advertized last year, the Council suggested that, as it had not been supported by the public, the shareholders, being very limited, be at liberty to cancel their engagements with the Council upon the receipt of principal and interest to date.

7th January, 1863.—The Superintendent of public works sent two requisitions for advance to contractor of drain in Keangse Road Tls. 1,000 and on Keangsoo Road Tls. 500 both of which passed the Board.

14th January.—Several letters were laid before the Board; from holders of Scrip in the Municipal Drainage Loan declining to accept the Council's offer of cancelling their obligations. Secretary was ordered to reply, requiring such to pay off their remaining instalments.

4th February, 1863.—Mr. Carlisle made his report. The Chairman asked if he had done any thing in regard to the Sikh Road. The inspector said he could not attempt to shingle it, until he succeeded in draining the road, upon which work his attention was now directed. Mr. Carlisle was directed to submit a detailed and effective plan, for draining all that district on the Old Race Course. This matter underwent much discussion, and it was finally agreed to open a drain from the Yang-king-pang in the centre of the Sikh road to carry off the stagnant water in that neighbourhood, as a commencement of a portion of the drainage scheme already resolved upon. The inspector was ordered to open contracts at once for this work.

11th February 1863.—With regard to the open drain ordered by the Council, the Inspector said that he had failed to obtain a contract for this work until the expiration of the Chinese New Year.

Correspondence from Mr. Gamwell respecting the alteration proposed by the Council in the Drainage Loan and transmitting a cheque for the balance allotted to W. E. Roach.

11th March, 1863.—Mr. Carlisle reported that he had obtained a contractor for the drain in Sikh Road. A medium drain at Tls. 24 per chang. Ordered to conclude the contract and commence the work at once.

Mr. Howes made his report and complained of the unhealthy state of a block of Chinese houses near the Soochow Creek, between Keangse and Keangsoo Roads for want of proper drainage.

18th March, 1863.—Mr. Carlisle reported one of the contractor of drains for neglecting his work. This man was brought before the Council and informed, that the Board would advance him Tls. 500 upon their understanding that he would apply himself diligently to his work.

* Drain called the Soochow Road.

The following are extracts from the Minutes of the Council Meetings held in the Municipal year 1863-64 on dates as under.

9th April, 1863.—The Chairman called Mr. Carlisle's attention, that no small connecting drains from the different Hongs past which the public main drains were being carried, were attempted to be made, and pointed out to the Board the evils likely to arise from subsequent interference with them. To meet this objection, it was ordered that the Secretary do publish a Notification that this privilege would be denied to house holders after a certain period and requesting all persons desirous of availing of the public sewers to intimate to the Superintendent personally or by a plan to mark the exact point at which they desired to connect the drains, in order that provision might be made for same during the construction of the main drains now in the course of construction.

29th April, 1863.—The contractor of Bridge street drain was advanced Tls. 1,000. The contractor of Church street drain Tls. 1,000, and the contractor for stone end to sewer was paid Tls. 150 as his work was completed.

13th May, 1863.—A requisition for Tls. 348 for stone, and one for a medium drain on Mr. Loureiro's property for Tls. 744 was passed by the Board.

20th May, 1863.—Mr. Carlisle made a report upon the drains now under construction. He said in reply to enquiries from the Chairman, that mud would collect within them from time to time, but that there were trap holes constructed in them every 30 yards, by means of which they could be kept clear.

17th June, 1863.—Mr. Carlisle informed the Board that he had not opened any fresh drains during the past week, but was proceeding with those in hand.

24th June, 1863.—The Superintendent of Public Works made his report, and said that one of the new drains connected with the Yang-king-pang had been injured by poles driven into them in the course of bunding. Police ordered to prevent any recurrence of the same.

8th July, 1863.—The question of proceeding at once with the general scheme of drainage then underwent full discussion by the Board the feeling being unanimous, that at this particular season of the year, the carrying on of extensive public works of this nature, would by largely opening the soil, lead to an increase of sickness in their immediate neighbourhood, and thereby defeat the most provident sanitary precautions. The matter was therefore, ordered to stand over for the present.

From Mr. E. M. Smith to the effect that if the drain was continued along the Chekiang Road, he would be enabled by private drains to carry off the stagnant water of some very offensive ditches in the neighbourhood, and offering primarily to supply the requisite funds for the work. Secretary to reply that whilst concurring in a great measure with Mr. Smith's views, the Board were nevertheless of opinion that to proceed with additional drainage operations would at present be highly inexpedient.

22nd July, 1863.—The drain in Foochow Road extending from Shan Tung Road to Keangsoo Road, was reported finished.

13th August, 1863.—*Works and Roads.*—The Bridge street drain was reported finished, and the contractor's bill passed for payment.

21st August, 1863.—The progress of the drainage operations was brought to notice, the Board deciding that no additional drains running East and West, should be commenced.

26th August, 1863.—The Church Street drain was stated to be completed as far as Rope Walk Road, and the contractor's bill passed for payment.

4th September, 1863.—The effective drainage of the settlement was brought under consideration, and Mr. Clark expressed his opinion that the present system with slight alteration in bottom of the drains would suffice for a more comprehensive scheme. It was decided that all connexions with the main drainage should be made by the Municipal Council, and the expense charged to the parties benefitted, and that manholes to main drains, should in future be formed in the side paths, with a heading to the drain.

9th October, 1863.—From Mr. Carter asking when a side drain was to be constructed in Honan Road. Secretary to reply that the system of side surface drainage would be extended to every street in the Settlement as the funds at the disposal of the Council permitted.

21st October, 1863.—Tenders for the construction of a drain in Canton Road.

From Mr. Carter on the subject of a side drain in Honan Road, to which reply had already been made.

28th October, 1863.—Estimates of the cost of drain in Canton Road.

31st December 1863.—The old drain in Honan Road was reported to be in bad state, the formation of manholes at intervals of 100 feet was recommended, and the sanction of the Board obtained to the continuation of the drain to the Soochow Creek.

13th January.—The Engineer's Report stated, that on opening the culvert in the Honan Road, for the purpose of draining it was found only to extend from Nauking Road to about 150 feet south of Foochow Road, where it discharged into a large culvert running E and W under the houses, there was a culvert from Canton Road to the Yang-king-pang Creek at such a level as would permit of the Honan Road drain being extended and connected with it at a cost of Tls. 1,650 (carried).

9th March, 1864.—*Engineer's Department.*—The Engineer's Report called attention to the accumulation of deposit in the sewers, and pointed out several drawbacks to the working of the present system of drainage. A drain was ordered to be proceeded with in the Sikhs Road, and the Engineer was requested to make a special report on drainage, prior to the approaching public meeting.

25th March, 1864.—*Engineer's Department.*—The Engineer's Report stated that on an examination of the Fuhkien Road sewer, it had been found necessary to reconstruct a portion of the mouth, and advised that as the new bridge had been constructed immediately over it, a small length of this sewer, which was the most convenient one for flushing, should be diverted, passed.

The following are extracts from the Minutes of the Council Meetings held in Municipal year 1864-65 on dates as under.

7th May, 1864.—The Engineer submitted a plan for extending the sewer in the Soochow Road from the Hankow Road to the Soochow Creek, which being approved of, directions were given for the commencement of the work as soon as possible as it was pointed out to the Board that this drain would relieve that part of the Old Race Course through which the Soochow Road runs of much of the stagnant waters now collected on the course.

15th June, 1864.—The Engineer's report stated "that the old sewer in Nanking Road, between Keangsoo and Keangsoo Roads was completely filled with deposit; this could be removed at night, but it would be scarcely wise to attempt a work of the kind at such a season of the year."

"Levels were being taken for a new sewer in Hangchow Road, but being so near the centre of the settlement it was most desirable that it should extend as far as possible westwards. From a few flying levels, already taken, it seemed that the extension might be carried back to the Fuhkien Road sewer, and when this was accomplished, the present drainage would be considerably assisted."

"The widening of the Defence Creek at the back of No. 10 redoubt, had been completed."

"The extension of the sewer in Soochow Road had been commenced and that in the Honan Road nearly finished."

"A drain was recommended to connect the latrine near Fuhkien Road with the sewer in that street." (Agreed to).

29th June, 1864.—A plan shewing section of proposed sewer in Hangchow Road was submitted, any length of which from the Bund, could be commenced immediately at Tls. 86 per chang.

7th July, 1864.—"A longitudinal section from the Yang-king-pang to the Hwangpoo river was forwarded shewing the relative weights of, and deposits in the different sewers."

13th August, 1864.—The Engineer's report stated "that the drains in Soochow and Honan Roads were progressing favorably, there had been a little trouble with the last named from its passing through made ground, but the worst part was now completed."

14th September, 1864.—In consequence of the carelessness of Leang-way, the contractor for the extension of the Honan Road sewer into the Soochow Creek, who had repeatedly failed to fulfil the terms of the contract by non-compliances with instructions given to him, thus frequently endangering the public safety, it had become necessary to take the work out of his hands, and arrangements for its completion by other parties were in progress.

22nd September, 1864.—The Engineer was authorized to proceed with the following works. The reconstruction of outlet to ponds on the old Race Course, and of the outlet of the Fuhkien Road Sewer.

12th October, 1864.—It had been necessary to let the incomplete portion of the Honan Road sewer to Zee-kie at double the former contract price, this increase being caused by the influence of the late contractor, who had circulated reports magnifying the difficulties of the work; as, however, there was but a short length wanting, the excess on that portion would make but a slight difference in the total cost. The sewer in the Soochow Road was progressing favorably.

19th November, 1864.—The Engineer's monthly report stated "that during the current month the sewers of the Soochow and Honan Roads had been completed, with the exception of their stone mouths; these might not be finished for some time, the contractor being dependent on the precarious supply from the quarries: in the meantime channels had been cut through into the creek for the passage of the waters."

11th January, 1865.—As connections with the main-drains were now so numerous, it seemed to Mr. Clark that it would be well if the Council made stated charges, to be payable as fees, by any person wishing to make connection from private drains, as besides the expense to which the Council was subjected, and the inconvenience the public experienced from the breaking up of the roads, the presence of one of the Engineer's staff (which was always necessary at any breach of the main-drains to prevent bad work) was an expenditure of time, for which the Council might fairly claim a fee as re-imbursement.

15th March, 1865.—The Engineer's report stated "that the drain in the Nankin Road, between the Keangse and Keangsoo Roads, which had been complained of by Mr. Hogg in the previous summer, was to have been cleansed during the past winter, and it would be necessary to do this before the hot weather set in." Agreed to.

7th June, 1865.—The drain in the Keangse Road, which had been crushed near the mouth, was authorized to be repaired, repairs not to exceed Tls. 350. It was further agreed that the old drain at the junction of the Hangchow and Fuhkien Roads should be connected with the Fuhkien Road sewer.

5th September, 1865.—Various repairs to the drains are necessary, but your committee do not feel authorized to sanction an expenditure amounting to over Tls. 2,000 without the consent of the Finance Committee. A drain has been constructed at small expense in Foochow Road, where it was regularly needed.

10th October, 1865.—The unusually high tides which have prevailed during the past month have caused much damage to the mouths of the sewers, which, the Municipal Engineer reports, were constructed (before his arrival) in a very unsatisfactory manner. Four have fallen in, almost choking the entrance and causing dangerous cavities in the roads. But for the low state of the Municipal Finances the necessary repairs would have been effected, and your Committee would ask for instructions as to how they shall attempt to remedy so serious an evil.

10th November, 1865.—The Council having authorized the necessary expenditure, your Committee have commenced the much needed repairs to the Keangse Honan and Fuhkien Roads sewers, which, as noted in last month's report, have fallen in.

7th May, 1866.—The Keangse and Fuhkien Roads drains are almost completed. The Honan Road drain is not yet finished. The surface drain in the Foochow Road between the Szechuen and Yangtsze Roads has been completed.

8th June, 1866.—The mouths of the Keangse and Fuhkien Roads drains have been completed. An additional length of drain has been added to the Honan Road sewer near the mouth discharging into the Soochow Creek; little now remains to be done to this drain.

8th August, 1866.—The repairs to the north end of the Honan drain are completed, and this road is now opened for traffic. The boundary wall of Messrs. Johnson & Co.'s premises, injured in the prosecution of this work, has been re-built by, and at the cost of the contractor.

16th November, 1866.—With the exception of repairs, &c. to some of the small drains, no other works have been undertaken in connection with the public sewers during the past three months. Your Committee propose to at once commence the proposed drain in the Nanking Road (Maloo) extending from the Fuhkien to the Honan Roads and also to form small drains in the Canton and Nanking Roads, running from the Bund and discharging into the Szechuen main sewer.

11th February, 1867.—The formation of sewers in the Upper Nanking or Maloo between the Fuhkien and Honan Roads, and in the Canton and Nanking Roads, between the Szechuen and Yangtsze Roads is now completed.

Your Committee beg to bring before your notice the fact, that a number of the old drains are gradually filling and becoming choked with mud. The Surveyor is at present examining these for the purpose of ascertaining which it will be necessary to re-open and clean during the ensuing year.

10th July, 1867.—Your Committee has completed the purchase of the portions of the Honan and Shantung Road sewers, as authorized by the Land Renters at the meeting of the 29th April last.

During the late heavy rains the Yang-king-pang mouth of the Szechuen sewer has given way, a tender has been accepted for the formation of a new and more substantial outlet.

12th November, 1867.—The diversion rendered necessary by the failure of the Yang-king-pang mouth of the Szechuen sewer has been effected. A side channel has been made in the Foochow Road extending from the Bund to the Szechuen Road sewer.

The cold weather having now commenced Your Committee have advertised for tenders for the construction of a sewer in the Shantung Road which is rendered necessary by the inutility of the old one in consequence of its defective levels. Tenders have also been invited for the the cleansing of the Shanse Road drain which at present contains a deposit of some 10 inches.

13th December, 1867.—The amounts authorized for the Shantung and Fuhkien Road drains were approved to be expended by the Public Works' Committee.

11th February, 1868.—The Shansi Road sewer from the Maloo to the Soochow Creek has been cleansed. The new sewer in Shantung Road is rapidly approaching completion. None of the main drains have been flushed with tidal water for a considerable time, owing to the recent low tides, consequently a quantity of filth has accumulated but which cannot be remedied under the present system without incurring a large outlay. All the cesspools and sinks have been cleansed during the late cold weather.

17th April, 1868.—In consequence of the Council's attention being called by Municipal Medical Officer to the number of stagnant pools on the open ground in the English Settlement, it was unanimously agreed to expend the sum of Tls. 500 (Five Hundred Taels) in draining off the water that has accumulated.

8th June, 1868.—Your Committee have received tenders for the laying of drains in the Tiendong and Woosung Roads Hongkew, but acting on the suggestion of Dr. Coghill, the Municipal Medical Officer who considered "that a certain amount of risk to the health of the Community would attend the opening up of the soil at this season of the year"—have decided to defer drainage operations until the cold weather sets in. The Keangse Road drain has been partially cleansed. A side channel is being formed in the North Shantung Road, and one to be laid in the Nanking Road from the Bund to the Chekiang Road has been contracted for. A small supply of earthen drain pipes has been purchased at a very low price. Open trenches have been formed in the back portions of the English Settlement to drain the stagnant pools.

4th August, 1868.—A further number of open trenches at the back of the English Settlement have been cut, to drain off stagnant pools. In the American Settlement similar trenches are being formed. The surface drain in the North Shantung Road has been completed. A drain has been constructed in the western part of the Foochow Road. The side drains in the Hankow Road between the Szechuen and Keangse Roads are being covered with stones.

6th October, 1868.—The drainage operations as proposed in the Budget, will be undertaken after the 15th instant, or as soon as the cool weather has regularly set in.

The agents of Mr. Wilkinson Dent have agreed to construct a box drain from the angle of the Kiukiang Road Jetty to the low water line of the Hwangpoo.

Messrs. Jardine, Matheson & Co. have been addressed with a view of having a similar drain constructed; they reply that they consider this work should be done by the Council, as the nuisance the Council complains of they consider to be mainly attributable to the construction of the Peking Road Jetty.

11th November, 1868.—The Council having taken into consideration the most suitable material, and the best mode of constructing the Keangse Road drain, it was moved by Mr. Yates, seconded by Mr. Cunningham and resolved:—No. 346. That the drain in the Keangse Road shall be built with 6 feet piles and granite slabs, and that the additional cost of Tls. 606 over and above the appropriation is hereby authorized by the Council.

9th February, 1869.—The relaying of portion of the drain in this road progresses satisfactorily, the contract time allowed for completion of the work, 180 fine days, the work is going on at three different points at the same time. The mouth at the Yang-king-pang end of this drain, is being reconstructed.

31st August, 1869.—The Keangse main sewer and small connecting drains have been finished to the satisfaction of your Committee, the contract time was exceeded in consequence of the strike of the stone cutters, the bad weather and Chinese holidays. Brick drains egg shaped are being constructed in the Seward and flat bottomed on the Yunan Roads (vide Minute Book p. 23). No danger whatever could arise to the health of the Community by this opening of the ground any more than from turning up the earth in the fields, therefore your Committee felt the greatest safety in proceeding with these important works. Your Committee have instructed the engineer to prepare plans specifications &c. for the re-construction of a mains ever in the Fuhkien Road, so that the work may be gone on with as soon as the cool weather sets in. Representations have been made to your Committee that in re-constructing main sewers private drains have been rendered useless as it is wholly impossible to construct any main sewer to suit the elevation of private drains, and to lessen the inconvenience to individuals as much as possible, your Committee have decided to notify persons whose drains will be effected by newly made main sewers in order that their small drains may be carried at an easy gradient to suit the main drain either by persons electing to do such work them selves or having it done at their cost by the Council. The Soochow Creek drain mouths have been cleared. Some of the box Yang-tsze Road near the drains on the Siccawei Road injured by the heavy rains during the middle of last month are being repaired. Drain pipes in the Public Garden have been laid. Drains, large and small, surface and cess pools (in Nanking, Fuhkien, Shanse, Shantung, Hooper, Sungkiang, Honan and Foochow Roads) have been cleared, and trenches or ditches (in upper part of Foochow and Hankow Roads) dug where necessary. The Rev. Mr. Yates on behalf of your Committee has arranged with a Chinaman to make musters of different sized earthen drain pipes. The musters are expected to come to hand shortly.

7th October, 1869.—The Seward and Yunan Roads main sewers, small drains, &c. have been completed. Tenders have been invited for the construction of brick sewers in the Fuhkien, Taiping and Keecheong Roads. Portion of the Chinese village called E-pa-doo, between the Szechuen and Keangse Roads is about being drained, also part of the Broadway by surface channels. Some of the box drains in the Siccawei and Sinzah Roads have failed they are being repaired and reconstructed when necessary. Ditches have been cut on both sides of the Bubbling Well Road, which will drain it, and small brick drains have been formed under the gateways of houses requiring the same, box drains have been put across the road where necessary. So soon as a supply of earthen drain pipes come to hand, drainage will be proceeded with in the back parts of the Settlements, the new Cemetery, &c.

Your Committee have pleasure in stating that the conditions of the main sewers are such as to render it necessary to cleanse only a portion of one this year.

A schedule of the main sewers shewing their form of construction, length, &c. is about being prepared and upon completion will be embodied in the annual report on drainage.

4th November, 1869.—Your Committee recommend that the tenders of Zung-zing-ang for the re-construction of the main sewer in the Fuhkien Road, and the formation of one in the Taiping and Keecheong roads be accepted, provided that satisfactory security be given by the tenderer. The brick drains under the gateways of houses on the South (Bubbling Well) Road have been completed. Box drains have been placed in the North Well (Sinza) Road as necessary.

Your Committee seeing no prospect of obtaining a supply of earthen drain pipes from the neighbourhood of Nanking suggest that the sum appropriated for the purchase of pipes at that place be applied to a suitable and inexpensive system of surface drainage in the back parts of the Settlements where it is so much needed, or that a supply of drain piping for this purpose be obtained from Hongkong or England. The Engineer has been directed to report upon the best means of draining the raised portion of the new Cemetery.

Note.—Decided to order a supply of drain pipes from England (as those received from Hongkong were found to be so very inferior) under a limit not exceeding Tls. 2,000 (two thousand taels) exclusive of freight. Mr. Cunningham kindly undertook to forward a muster drain pipe to Kinkiang and ascertain if it were possible to have some manufactured at the Potteries in the neighbourhood of the Poyang Lake. As regards the drainage of the new Cemetery, the meeting were of opinion it would be better to defer it if possible until earthen drain pipes could be procured.

2nd December, 1869.—Contracts have been completed for laying main sewers in the Fuhkien, Taiping and Keecheong Roads. Plans and specifications for a main sewer in the western part of the Tien-tsin Road are being prepared, and tenders will be invited for its construction.

The drain mouths and cesspools where necessary have been cleansed.

17th December, 1869.—Your Committee propose devoting the sum of Tls. 972 appropriated for drainage in Hongkew to the requirements of that Settlement, and in furtherance of which purpose they have had plans and specifications for a main sewer in the western part of the Tientsin Road prepared, and tenders will be invited for its construction.

6th January, 1870.—The Nanking Road drains between the Honan and Keangse Roads has been cleansed. The Fuhkien Road drain &c. is being proceeded with as quickly as possible. The Taiping and Keecheong Roads drains are in hand.

11th February, 1870.—The Engineer's last report says "work has been resumed at the Fuhkien and Keecheong drains and "fair progress has been made." A representation has been received from the Hongkew Wharf Company of the defective state of the drain under the Chau Fong Road which the Company says is "materially damaging the ground work on which some of "their godowns are built." This matter has been referred to the Municipal Engineer to report upon.

3rd March, 1870.—The Engineer's last report says that "work has been commenced in four different places in the Fuhkien Road. The main drain in the Keecheong Road has nearly been completed and the Taiping Road one is being proceeded with as rapidly as the weather permits."

The tender of Tsang-ta-yuen has been accepted for the construction of 55 chang of drain in the western part of the Tientsin Road at the following prices:—

Large,	Tls. 6.80 per chang.
Small,	" 4.50 "
Sinks,	" 3.80 each.

The mouth of the Chaow-foong Road drain in Hongkew is about being repaired.

5th April, 1870.—The Engineer reports as follows—"The Fuhkien, Taiping and Keecheong drains are progressing in a favorable manner. About five chang of small drain is being laid in the Ningpo Road near the Shanse, to take off the stagnant water which at present is a great nuisance. Part of the Nanking drain at its junction with the Honan has been reformed."

Your Committee received a letter from Mr. E. Jenner Hogg complaining of damage done to his property by the re-construction of the Fuhkien Road drain. Mr. Hogg was informed that the damage complained of will be repaired.

The Agents of the Hongkew Wharf Company have requested your Committee to extend the Chow Fong drain to low water line.

30th May, 1870.—The re-laving of a main sewer in the Fuhkien Road, the construction of a similar description of culvert in the western portion of the Tien-tsin Road and in regard to which the Engineer reports that the mains of both these drains have been completed. The forming of small connecting drains and cesspools are being proceeded with as quickly as possible.

The Keechong and Taiping drain mouths have been completed. Mr. Mayne, Manager of the Hongkew Wharf, applied to your Committee's predecessors to have the Chow Fong drain mouth carried over the mud flat to low water line some sixty feet. He was asked to share the expense of doing so but declined. Your Committee have decided, in consideration of the drain being a public one, to extend it.

13th June, 1870.—The Council were informed in regard to the Chinese drains as follows.—That the present Chinese drains had neither brick nor stone bottoms. The bottoms were simply earth, the sides being brick and stone slabs for the top or cover. To utilize these drains would be equal in cost to making new drains as by their present construction they had no fall and did not form part of a system. It would be better to obtain earthen drain pipes from England to lay in the present beds, these could then be accommodated so as to serve with or as part of the main sewers system. The cost of cleansing out the present Chinese drains would be about Tls. 2 per 10 feet.

On the subject of traps to drain mouths the Engineer was of opinion that some of the older drains would not at present stand flushing. He could not recommend the adoption of traps to the drain mouths as there were only three or four tides in the year that reached the summit of the drain.

20th June, 1870.—A supply of earthen drain pipes has been ordered from England by the last mail.

1st August, 1870.—Messrs. Cowan & Co. of Blaydon Kurn near Blaydon on Tyne under date of 27th May, write in regard to a supply ordered by your Committee's predecessors as follows—"we are favored with your order for £500 worth of earthenware sewerage pipes. The pipes will all be ready in from two to three months, but the larger portion of them could be shipped "in six weeks from this date. The pipes will occupy in bulk about the same space as 20 keels of Coal."

DRAINAGE.

Expenditure on Drainage from 1st May 1862 to 31st March 1870.

	Tls.	Tls.
Fuhkien Road,	10,110.96
do. to Dye House,	1,704.00
do.	528.00
do.	9,357.00
		21,700.51
New Street and Maloo,	3,174.00
Maloo to Defence Creek,	1,644.00
do. Kwangsee Road,	1,124.00
Keangse Road,	15,767.00
do.	487.64
do.	5,802.03
do.	1,266.90
		23,323.57
Keangse Road and Fuhkien Road New Outlet,	1,131.00
Szechuen Road,	11,332.00
do.	428.00
do. and Hankow Road,	500.00
		13,088.89
Chekiang to Hoopeh Roads,	12,260.00
Foochow Road,	3,312.00
Canton do.	1,980.00
Honan Road,	2,687.50
do.	5,702.08
do. purchase of	2,602.80
		10,992.38
Shantung Road,	2,217.96
do. purchase of	1,371.80
		3,589.76
Seward Road,	1,667.00
Taiping and Keechong Drains,	751.41
Middle of Nankin Road and from Keangse to Kiangsoo Road,	2,900.00
Yunan Drains,	401.38
Ningpo do.	129.00
Cleansing Drains,	2,805.21
Water Tunnels, Small Drains, Cesspools, &c., &c.,	7,403.91
Total,...	Tls. 113,387.02

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